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FIG. 3A shows a perspective view of an optical modulation device according to the present invention. FIG. 3B and FIG. 3C respectively show a side cross sectional view and a front cross sectional view thereof.

In FIG. 3, a group of (scanning) electrodes comprising a plurality of electrodes 302 are formed in a predetermined pattern by etching on a base plate 301 of glass, plastic, etc. On the electrodes, an insulating film 303 is formed. On the insulating film 303, a plurality of spacer members are formed and arranged in a stripe form. The spacer members may be formed in shapes other than the stripe shape. It is preferable that the spacer members 304 are formed by selecting a suitable material selected from materials having a hardness lower than that of the insulating film 303. For example, there may be used resins such as polyvinyl alcohol, polyimide, polyamide imide, polyester imide, polyparaxylylene, polyester, polycarbonate, polyvinyl acetal, polyvinyl chloride, polyvinyl acetate, polyamide, polystyrene, cellulose resin, melamine resin, urea resin, acrylic resin, etc., photosensitive polyimide, photosentive polyamide, cyclic rubber photoresist, phenol novolac photoresist, electron beam resist (polymethyl methacrylate, epoxidized-1,4-polybutadiene, etc.)

On the other hand, the insulating film 303 may be selected from materials capable of preventing electric currents from flowing into molecular layers of the liquid crystal 305 and having a hardness higher than that of the above-mentioned spacer members 304. For instance, the insulating film 303 may be formed by using compounds selected from silicon nitride, silicon nitride containing hydrogen, silicon carbide, silicon carbide rubbed can provide the wall effect for the orientation of the liquid crystal. In this instance, the liquid crystal 305 having bistability in contact with the side walls 306 and 307 is horizontally aligned or oriented in a direction parallel or substantially parallel to the base plate 301, i.e. in the rubbing direction ("homogeneous orientation"), since the insulating film 303 does not have a wall effect for preferentially orienting the liquid crystal or has only a weak wall effect, as described later.

As stated above, the insulating film 303 is formed by a material selected from materials having a hardness higher than that of the spacer members 304. Accordingly, even if the insulating film 303 is rubbed, the plane 308 thereof does not have a preferential direction for orienting the liquid crystal (in contact therewith) to a third, metastable, or strongly stable, state directed in one direction. However, when there are no side walls 306 and 307 to which the wall effect is given by the above-mentioned rubbing treatment (viz. there is no influence of the wall effect therearound), it is possible for the plane 308 to have a weak wall effect for horizontally orienting the liquid crystal in random directions. In this instance, it is preferable that a wall effect for vertically orienting a liquid crystal (homeotropic orientation) is not given to the plane 308. Further, the side walls 306 and 307 and the plane 308 thus rubbing treated may preferably be rinsed with acetone, etc. and thereafter subjected to a surface treatment using a horizontal alignment agent e.g. a silane coupling agent, a surface active agent for horizontal alignment, etc.

The optical modulation device according to the present invention is further provided with another base

US-PAT-NO: 6479402

DOCUMENT-IDENTIFIER: US 6479402 B1

TITLE: Method to improve adhesion of molding compound by providing an oxygen rich film over the top surface of a passivation layer

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Detailed Description Text - DETX (2):

As examples of passivation materials can be cited silicon dioxide, silicon nitride, a conventional oxide/nitride/oxide or Si.sub.x N.sub.y passivation layer comprising a dielectric material such as a silicate (such as silicon dioxide, tetraethylorthosilicate based oxides, etc.), phosphosilicate (phosphate-silicate-glass), borophosphosilicate glass (borophosphate-silicate glass), borosilicate-glass, oxide-nitride-oxide glass, tantalum pentoxide, plasma etched silicon nitride, titanium oxide, silicon oxynitrides, etc.

pattern;

securing said substrates together with said first plurality of electrodes facing said second plurality of electrodes and with said spacers between said substrates; and

12. A method as defined in claim 11 wherein said spacers are formed of electrically insulating material.

15. A method as defined in claim 11 wherein said step of forming said spacers includes applying a continuous layer of spacer material over said second substrate and selectively removing area portions of said layer of spacer material to leave remaining said spacers in said predetermined pattern.

17. A method as defined in claim 11 including the step of forming a plurality of said spacers on both said substrates in a predetermined pattern.

18. A method as defined in claim 17 including the step of patterning said spacers on both said substrates such that the spacers on one said substrate abut the spacers on the other said substrate when said substrates are secured

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the color filter layer 31 and an FLC 35 is disposed. The protection layer 32 can also be provided with an insulating property and an alignment control property. Reference numerals 33a and 33b denote substrates comprising, e.g., a glass plate or a plastic film, on which stripe-form transparent electrodes 34a and 34b constituting matrix electrodes of ITO (indium-tin-oxide), etc., are provided. A layer 36 is an alignment control film and can be

The protection layer 32 used in the present invention may be formed of any material selected from inorganic insulating materials such as silicon nitride, silicon nitride containing hydrogen, silicon carbide, silicon carbide containing hydrogen, silicon oxide, boron nitride, boron nitride containing hydrogen, cerium oxide, aluminum oxide, zirconium oxide, titanium oxide, magnesium fluoride, SiO and SiO.sub.2 ; or organic insulating materials such as polyvinyl alcohol, polyimide, polyamideimide, polyesterimide, polyparaxylylene, polyester, polycarbonate, polyvinyl acetal, polyvinyl chloride, polyvinyl acetate, polyamide, polystyrene, cellulose resin, melamine resin, urea resin, acrylic resin and photoresist resin. The thickness of the protection layer may suitably be 5000 .ANG. or less, preferably 100-5000 .ANG., particularly 500-3000 .ANG..

In order to form a liquid crystal device with a panel size, a spacer member, e.g., in an elongated shape having a substantially larger length than a diameter such as glass fiber, or a substantially spherical or spheroidal shape such as glass beads, alumina beads or plastic beads, may be disposed between a

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display device in accordance with the present invention is configured in a preferred embodiment so that the spacers do not sink into the interlayer insulating film by optimizing materials of the interlayer insulating film and spacers . As a result, various problems with the liquid crystal display device using the resin-made interlayer insulating film are successfully solved.

In addition, in order to keep the space between the substrates constant, the liquid crystal display device preferably includes a middle film, provided on the sealing area of the base substrate, having better adherence than the base substrate. With this configuration, the adherence of the sealing member portion is improved, and the highly reliable liquid crystal display device can be obtained. Moreover, the middle film is preferably at least one film selected from the group consisting of a metallic film, a nitride film and an oxide film. In this case, the material for the middle film becomes the same with the material for the source wiring of the switching element and the like. Therefore, one process can be shared for forming the switching element and for forming the middle film, which is especially preferable.

Spacers 7 are provided between the TFT substrate 10 and the opposite substrate 20 to maintain the space therebetween. Here, an acrylic resin having a Rockwell hardness of M90 is used as the interlayer insulating film 9, and a polystyrene having a Rockwell hardness of M80 is used as the spacers 7.

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US-PAT-NO: 6441879

DOCUMENT-IDENTIFIER: US 6441879 B2

TITLE: Liquid crystal display device

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A liquid crystal display device is provided with a switching element in neighborhoods of crossing points of a gate wiring and a data wiring. An interlayer insulating film is provided on the switching element. A pixel electrode connected with the switching element is provided on the interlayer insulating film. Moreover, a spacer for keeping a thickness of a liquid crystal layer constant is disposed in the liquid crystal layer and in a sealing member for sealing the liquid crystal layer. Materials of the interlayer insulating film and spacers are optimized. This configuration prevents degradation of a defective ratio and reliability due to the spacer disposed in the liquid crystal layer sinking into the interlayer insulating film.

Finally, the manufacturing process of the conventional liquid crystal display device becomes complete with sealing liquid crystal 58 between a TFT

US-PAT-NO: 5897354

DOCUMENT-IDENTIFIER: US 5897354 A

TITLE: Method of forming a non-volatile memory device with ramped tunnel dielectric layer

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Detailed Description Text - DETX (34):

The device may also be equipped with one or more passivation layer(s) as desired and/or necessary, comprising a dielectric material such as a silicate (silicon dioxide, tetraethylorthosilicate based oxides, etc., phosphosilicate (phosphate-silicate-glass), borophosphosilicate glass (borophosphate-silicate glass), borosilicate-glass, oxide-nitride-oxide glass, tantalum pentoxide, plasma etched silicon nitride, titanium oxide, silicon oxynitrides etc. Bonding contact masks may be used to expose bonding pads for bonding during assembly. The methods for forming of such passivation layers and bonding pads is conventional and known to those of ordinary skill in the art.

US-PAT-NO: 5911887

DOCUMENT-IDENTIFIER: US 5911887 A

TITLE: Method of etching a bond pad

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Detailed Description Text - DETX (8):

Examples of passivation materials are silicon dioxide, silicon nitride, a conventional oxide/nitride/oxide or Si.sub.x N.sub.y passivation layer(s) as desired and/or necessary, comprising a dielectric material such as a silicate (silicon dioxide, tetraethylorthosilicate based oxides, etc., phosphosilicate (phosphate-silicate-glass), borophosphosilicate glass (borophosphate-silicate glass), borosilicate-glass, oxide-nitride-oxide glass, tantalum pentoxide, plasma etched silicon nitride, titanium oxide, silicon oxynitrides, etc.